Workshop Session #2:

Human Effectiveness and Embedded Training Environments

Summary of Discussion

Dr. Dee Andrews (USA) and Dr. Jan Roessingh (NED) facilitated this workshop session centered on embedded training environments and specifically on training management and distributed embedded training modes. Three presentations were provided for discussion:

- *Training effectiveness of embedded training in a (multi-) fighter environment* -Jan Roessingh, Ph.D. (NED) National Aerospace Laboratory; and LTC Gerbe Verhaaf (NED)
- *Developing Effective Embedded Training* - Jan Cannon-Bowers, Ph.D. (USA), University of Central Florida Institute for Simulation and Training
- *Leveraging Embedded Training Systems to Build Higher Level Cognitive Skills in Warfighters* - Mica Endsley, Ph.D. (USA), SA Technologies; Jennifer Riley, Ph.D. (USA), SA Technologies; and Laura Strater, Ph.D. (USA), SA Technologies

Workshop Exercise #2: *Mindmapping Embedded Virtual Simulation training management*

For this session, the mindmapping exercise focused on EVS training management and the primary and the five secondary questions below were intended to focus and energize the discussion:

- **How do you manage training in EVS?**
  - What are viable instructional strategies for EVS?
  - What categories of metrics can be used to manage EVS?
  - How do you manage training sessions?
  - How do you envision tasks currently accomplished by "white cell" personnel?
  - How will you manage training in different modes (homestation, in transit, in theater)?

The mindmaps shown below are the group products from Exercise #2 on EVS training management:

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
OCT 2009	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Workshop Session #2 Human Effectiveness and Embedded Training Environments Summary of Discussion	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **NATO**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
See also ADA562526. RTO-MP-HFM-169 Human Dimensions in Embedded Virtual Simulation (Les dimensions humaines dans la simulation virtuelle integree)., The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**SAR**	**6**	

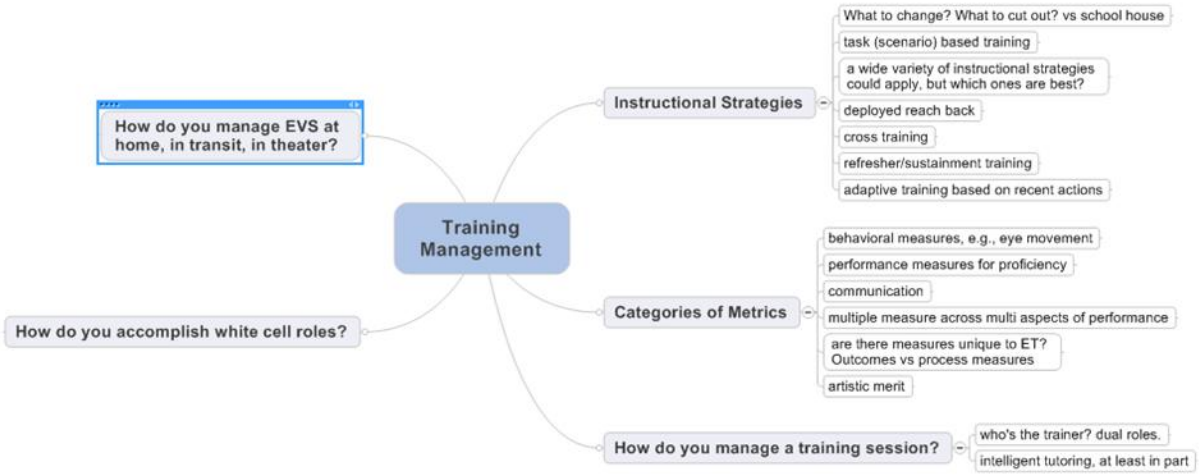

Figure 1: Group 1 Mindmap for Exercise #2

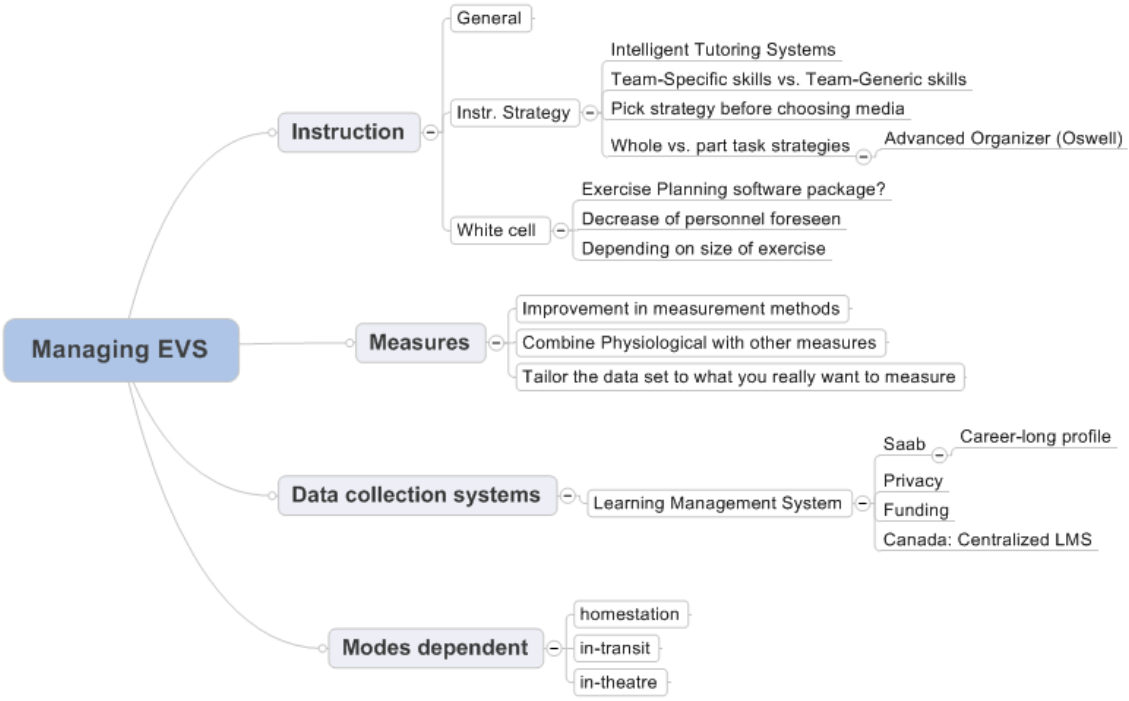

Figure 2: Group 2 Mindmap for Exercise #2

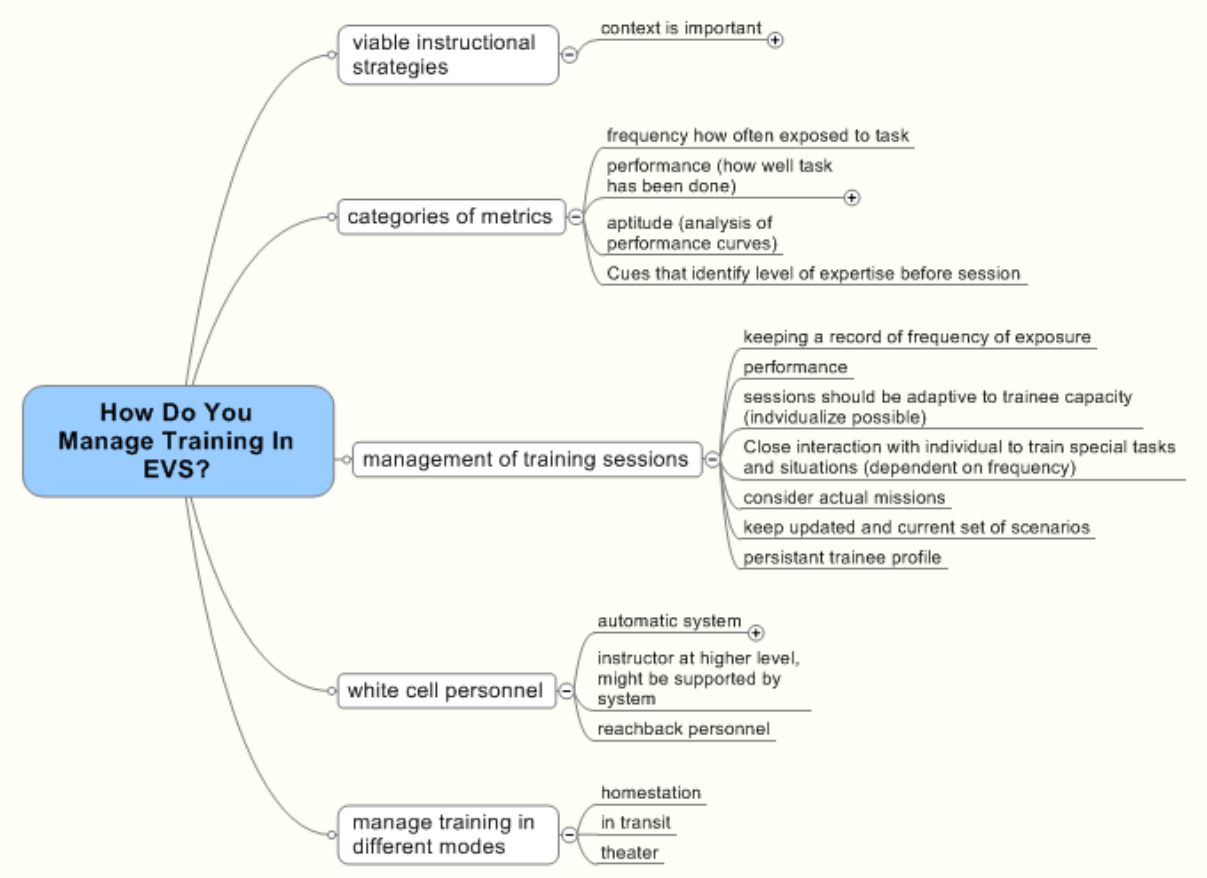

Figure 3: Group 3 Mindmap for Exercise #2

For this session, the mindmapping exercise focused on EVS training management and the primary and the five secondary questions below were intended to focus and energize the discussion. Below is a summary of the outcomes of the joint results of the three discussion groups:

What are viable instructional strategies for EVS?

The simplest instructional strategy seems to just confronting the trainee with a scenario (Scenario Based Training) using EVS, i.e. involving some degree of simulation. Thus, constructing an appropriate scenario is the minimum effort that needs to be made in terms of devising an instructional strategy. This however, can be a major effort in the complex skill domains we are looking at for ET in the military.

Additional instructional strategies that were mentioned are: whole-task training with injection of virtual entities into the training scenario, instructional strategies based on intelligent tutoring (replacing the human instructor), instruction strategies that are based on remotely monitoring of the exercise and providing instructor feedback via radio (e.g. emphasis training), adaptive training, in which parameters of the training environment (level of complexity, speed, etc.) will change depending on progress of the trainee.

It can helpful if ET developers structure Advanced Organizers for the training. David Ausubel (????) posited that it is important to present to learners a cognitive scaffold of the material to be learned before they begin learning the details. Ausubel's advance organizer can best be classified as a deductive method. Deductive methods or reasoning provide the rule to follow then the example leading to the correct answer or learning (Mayer, 2003). This is opposite from inductive methods or reasoning that provides the example to follow then the rule.

Advance organizers are also highly useful in the process of transferring knowledge. Because of the deductive reasoning, students are able to use the rule then the example for learning to occur. Mayer writes in his text, "...the effects of advance organizers should be most visible for tests that involve creative problem solving or transfer to new situations, because the advance organizer allows the learner to organize the material into a familiar structure" (Mayer, 2003).

– Mayer, R. (2003) Learning and Instruction. New Jersey: Pearson Education, Inc

Part of the instruction strategy could be that while being deployed, e.g. in Afghanistan, that trainees can "reach back" to their home country, e.g. a school or any other training resource.

Finally, cross-training was mentioned, i.e. team training in which team members take on other team members' roles and responsibilities, resulting in shared awareness of the teams tasks, roles, responsibilities and capabilities.

An important instructional strategy that was *not* mentioned by any of the participants was part-task training. Can we conclude that part-task training is not a viable instructional strategy for ET, because ET, implemented on a weapon platform, is naturally bound to a whole-task context?

If so, the viability of instructional strategies seems to depend on their suitability for imposing the strategy on the whole-task context.

More general remark were:

(1) that the selection of training media should not be done before an appropriate instructional strategy has been selected.
(2) that the appropriate instructional strategy depends on the instructional objectives and the training program as a whole.

What categories of metrics can be used to manage EVS?

Distinction was made between (1) outcome measures (*how well* the mission / task goals have been achieved), and (2) process measures (*how* mission / task goals were or were not achieved, e.g. frequencies of certain behavior, communication, mutual support in teamwork, etc.).

At the same time, because ET relates to complex task performance, there is a need for multiple measures, covering multiple aspects of behavior (behavioral measures, psycho-physiological measures). In addition, the need for analysis of performance- or learning curves was mentioned, an issue that also has been considered under the heading of training management / learning management systems.

Behavioral measures that were mentioned were eye-movement measures (EPOG, blink frequencies, pupil diameter). It was realized that certain performance measures may not be applicable to ET, for example those collected by a human instructor for feeding back immediately to the trainee, because human instructors are not always present in an ET concept, which highlights the need for Intelligent Tutoring Systems. Finally, the need was expressed for getting a measure (cues) for the level of expertise of a trainee before starting the ET session, in order to set the appropriate scenario.

How do you manage training sessions?

ET seems to diminish the role of the human instructor, simply because simulation hard/software is attached to real systems hardware/software, resulting in a training medium that most often doesn't provide physical space for a human instructor. Thus feedback from a human instructor will often be delayed to some point after the mission exercise, i.e. during an After Action Review (AAR) or mission debriefing.

The dual role of the supervisor was mentioned, probably meaning that he is both supervisor of the trainee (senior person) and has an instructional role in deciding what to do next.

An obvious remark is that the instructor could be replaced by an intelligent tutoring system. At a meta-instruction level, the training sessions could be managed by a Learning Management System (LMS).

How would it interface with the EVS?
Functional requirements imposed upon such system are:
- record keeping of exposure to specific training events (counting);
- scheduling trainee events in order to optimize the learning process;
- scenario configuration management (which scenarios are updated and ready for use);
- persistent trainee profiling (possibly throughout his career) on the basis of performance measures.

How do you envision tasks currently accomplished by "white cell" personnel?

White cell personnel is the support personnel during live exercises, e.g. fulfilling role playing tasks, exercise performance scoring, refereeing, control of opposing forces (SAFs), etc. Some participants hypothesized that ET implementations could make white cell Personnel superfluous by automating their tasks. This is certainly dependent on the level of intelligence and autonomy of the various entities in the ET virtual scenario.

The question was raised whether exercise planning software packages exist, presumably to allocate tasks in ET scenarios to white cell personnel, or rather: Do scenario management systems for real or simulated exercises currently support entities for white cells?

How will you manage training in different modes (homestation, in transit, in theater)?

This question invoked no reactions by the 35 participants, certainly because the session was too short to address all five questions, and this was the last question.